Thermodynamics

**Laws of Thermodynamics**

Zeroth Law

If two systems are in thermal equilibrium with a third system, they are also in thermal equilibrium with each other.

First Law

Energy is always conserved.

Second Law

Entropy tends to increase over time. The differences in temperature, pressure and chemical potential tend to reach equilibrium.

Third Law

Entropy approaches zero as temperature approaches absolute zero; a substance cannot be cooled to zero Kelvin (or Rankine).

**Carnot Cycle**

The Carnot Cycle is the ideal cycle for converting energy to work. However, this is merely an ideal cycle, since it relies on the fact that entropy does not change.

If energy is transferred from a warm reservoir to an intermediate medium and then energy is transferred to the cold reservoir, then work is.

Efficiency is

Also, if and are the temperatures of the two reservoirs, then.

Resource here: <http://hyperphysics.phy-astr.gsu.edu/hbase/thermo/carnot.html>

**Joule’s Laws**

Know these: <http://en.wikipedia.org/wiki/Joule's_laws>

**Temperature – Entropy Diagrams**

The area enclosed is work, the area under is heat transfer.

See here: <http://en.wikipedia.org/wiki/Temperature%E2%80%93entropy_diagram>

**Pressure – Volume Diagrams**

The area under the graph is work.

<http://en.wikipedia.org/wiki/Pressure_volume_diagram>

<http://physics.info/pressure-volume/>

**Branches of Thermodynamics**

Classical – Large scale

Statistical – Atomic scale

Chemical – Reaction scale

Equilibrium – Thermal equilibrium

Non-equilibrium – Self-explanatory

**If all else fails**

<http://en.wikipedia.org/wiki/Thermodynamics>

**Building part**

Build a thermos which holds a beaker. Make graphs of temperature vs. time.